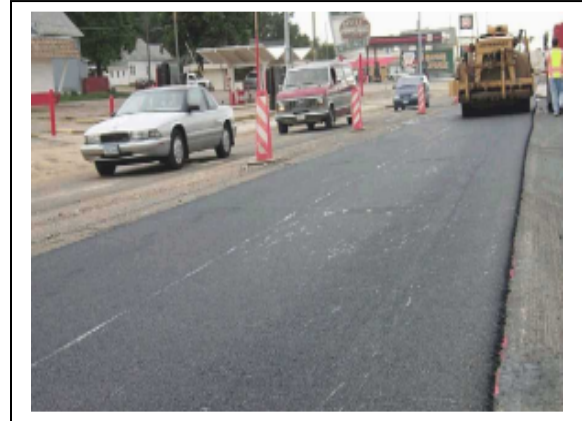


VIII. Limitations and Miscellaneous Operations

Public Convenience and Safety

(Specification 1107.08)

When it is not practical for the Contracting Authority to close the road for construction, the contractor will be expected to perform the work under traffic. The contract documents will indicate this fact and provide instruction on handling traffic through the work zone. If traffic is to be maintained through the project, the contractor shall conduct the work to assure the least possible obstruction to access by residents along the project, and to provide for the safety of workers and the traveling public.



Unless otherwise stated in the contract documents, all work shall be performed by the contractor between the hours of 30 minutes after sunrise and 30 minutes before sunset. Charts and tables of official daily sunrise and sunset times for locations throughout the state are readily available, and may be used as a basis in determining specification compliance.

The contractor's machines and equipment should all be in good mechanical condition. This should also include all safety guards required for the equipment. This is for the protection of workers and inspection staff in the immediate area, as well as the nearby traveling public.

Date	Time	Location
01/01/2000	06:58	01/01/2000
01/02/2000	06:57	01/02/2000
01/03/2000	06:56	01/03/2000
01/04/2000	06:55	01/04/2000
01/05/2000	06:54	01/05/2000
01/06/2000	06:53	01/06/2000
01/07/2000	06:52	01/07/2000
01/08/2000	06:51	01/08/2000
01/09/2000	06:50	01/09/2000
01/10/2000	06:49	01/10/2000
01/11/2000	06:48	01/11/2000
01/12/2000	06:47	01/12/2000
01/13/2000	06:46	01/13/2000
01/14/2000	06:45	01/14/2000
01/15/2000	06:44	01/15/2000
01/16/2000	06:43	01/16/2000
01/17/2000	06:42	01/17/2000
01/18/2000	06:41	01/18/2000
01/19/2000	06:40	01/19/2000
01/20/2000	06:39	01/20/2000
01/21/2000	06:38	01/21/2000
01/22/2000	06:37	01/22/2000
01/23/2000	06:36	01/23/2000
01/24/2000	06:35	01/24/2000
01/25/2000	06:34	01/25/2000
01/26/2000	06:33	01/26/2000
01/27/2000	06:32	01/27/2000
01/28/2000	06:31	01/28/2000
01/29/2000	06:30	01/29/2000
01/30/2000	06:29	01/30/2000
01/31/2000	06:28	01/31/2000

The condition of the haul roads used by the contractor should also be inspected. The contractor has the responsibility to maintain dust control on these roads, and the inspector has the responsibility to assure they do so.

If any violations of the specifications or any safety problems are noticed, the inspector should notify the contractor immediately. The grade inspector should also notify the inspector in charge of the project as soon as possible. Any violations or problems and conversations with the contractor about them should be noted in the inspector's diary.

Mat Surface Conditions

(Specification 2303.03, C, 4)

HMA mixtures shall not be placed on a wet or damp surface. An HMA overlay placed on a wet or damp surface may result in a slippage or sliding-type failure of the overlay. This failure mode, which usually shows up relatively quickly, requires removal and replacement of the affected overlay.

Clearly, HMA placement should not start if wet conditions exist or rainfall is imminent. The major issue is what to do if rain begins at some point during paving. Some contractors expect to be able to place the remaining "trucks on the road" despite wet conditions. The contractor should not be allowed to place HMA under wet or damp conditions simply because the trucks have already been loaded. Contractors must take a proactive approach in assessing the weather conditions with forecasts, radar, etc., and adjusting their operations accordingly. This includes slowing or stopping the plant as rain approaches to minimize loads arriving at the paver after rain begins.

There is still some room for judgement on the part of the field inspector. If the rain has temporarily stopped and using a broom and/or air compressor can artificially dry the



surface, then waiting load(s) can be placed. This assumes the temperatures of the road surface and hot mix have remained above the respective specification minimums, the tack coat remains in place and undamaged, and that placement and compaction can take place prior to additional rains.

Surface Temperature

(Specification 2303.03, C, 4)

HMA mixtures shall not be placed when temperature of the shaded portion of the roadway surface is less than shown in the tables within the specification listed above. The tables provide minimum surface temperatures based on thickness and location of the lift to be placed. The project engineer may further limit placement when other conditions exist that are considered detrimental to quality work. An example of this situation is when the temperature is near the minimum and wind is significant.

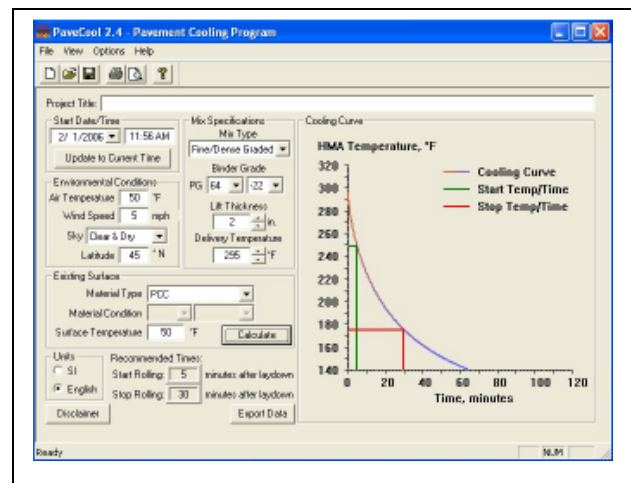


Mat Cooling

(Construction Manual Section 8.55 & Appendix 8-2)

Base temperature is the single greatest factor in the rate of cool down for freshly placed HMA mat. Consequently, base temperature has direct affect on recommended minimum laydown temperature and rolling time available to obtain specified density. The tables in Construction Manual Appendix 8-2 illustrate this relationship.

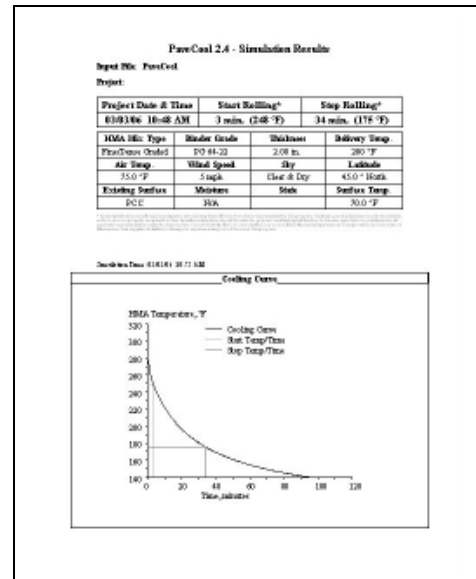
Wind velocity, air temperature, and cloud cover are additional factors that affect the cooling rate of HMA. *PaveCool* is a software program, developed by the Minnesota Department of Transportation and Minnesota Asphalt Paving Association,



that can be used to determine approximate cooling rates for hot mix asphalt pavement under various conditions. The program uses numerous variables to graph cooling curves and provide a resulting “time available for compaction” following mix laydown.

The latest version of the *PaveCool* software is currently available to download through links provided under “Hot Mix Asphalt (HMA)” on the Office of Construction websites found on DOTNET (for DOT network users) and the world wide web (www). A *PaveCool* link is also provided within Construction Manual Section 8.55 text on the Electronic Reference Library (ERL) version.

This program is not intended to replace good engineering judgement; rather, it is a tool to provide the user with insight on how actual climate conditions affect the time available for compaction of HMA mixtures. Results can be used to decide when to pave and/or make compaction operation adjustments.



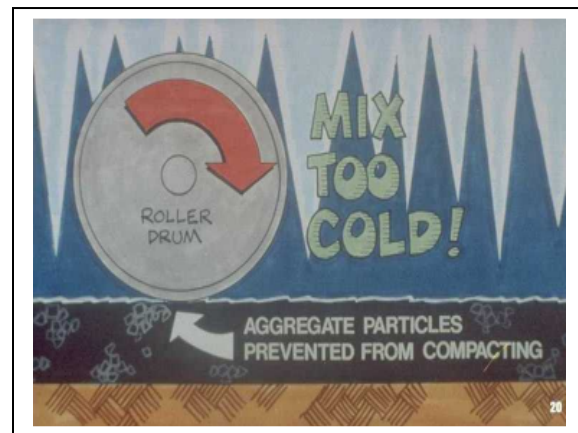
Mix Temperature

(Specification 2303.03, C, 3)

The mix temperature is usually established at the plant. It is important to know what the minimum, maximum and intended temperatures are for the mix you plan to use.

Minimum Temperature

The minimum mix temperature for placing a nominal layer thickness of 1-1/2 inches or less is 245 degrees F. The minimum mix temperature for placing a nominal layer thickness greater than 1-1/2 inches is 225 degrees F. A mix temperature that is too low will allow the mat to crack and tear under rolling operations. Also, specified



compaction and mat density will be hard to achieve if mix temperature is too low.

Maximum Temperature

The maximum temperature of all mixes is 330 degrees F, unless otherwise approved by the Engineer. Overheating a mix may burn the “oil” in the mix and produce a mix with undesirable properties. The appearance of blue smoke rising from a loaded delivery truck is indication of an overheated mix.

A mix temperature that is too high may also lead to shoving and blistering of the mat during rolling operations.

Temperature Consistency

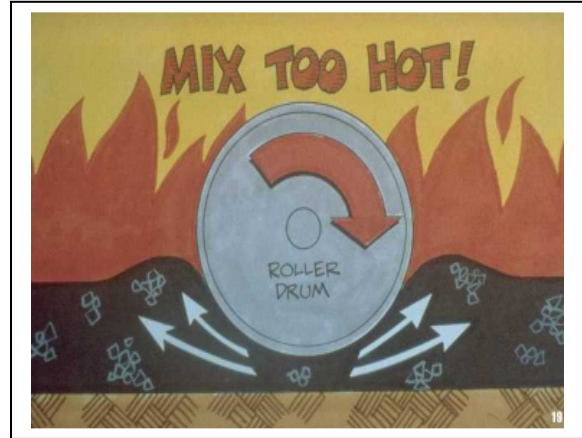
Consistent mix temperature is essential for uniform compaction of the mat. The plant must be operated so that the temperature of the mixture at discharge does not vary by more than 20 degrees F. Locations for taking mix temperature readings include:

- Plant Site
- Truck Box
- Mat, directly behind the paver
(readings should be taken every 2 hours and recorded)

Calendar Dates

(Specification 2303.03, C, 4)

HMA mixtures shall not be placed after November 15, except with approval of the Project Engineer. Placement of wearing (surface) courses one inch or less in design thickness may be further restricted by the contract documents or Project Engineer.



Haul Roads

*(Specifications 1105.13 & 1107.07;
Construction Manual 2.12)*

A haul road is the designated road on which the contractor is to haul material to the grade from the plant or supplier. There are many considerations given to a road before it is declared a haul road. The structure of the road, weight restrictions of structures, traffic signing, and other aspects are reviewed before a road is declared a haul road. An agreement is reached with the affected entity (city or county) before its roadways are used as designated haul roads.

There will be occasions when the haul road will not be the most direct route for the contractor to take and, consequently, they may want to use a different road. It is the responsibility of the both the grade inspector and plant monitor to insure the contractor is using the designated haul road. If the contractor is allowed to use different roads than those designated as haul roads, the county or city that owns the road will most likely seek damage considerations.

Specification Article 1107.07, “Safety, Health, Pollution, and Sanitation”, and Construction Manual Section 2.12 explain when and how dust control should be maintained. These items should be reviewed before operations begin.

Milled Shoulder Rumble Strips

*(Specifications 2308 & 2548;
Standard Road Plans RH-64 and PV-12)*

Milling has become the method of choice for installing rumble strips in HMA paved shoulders. The process utilizes a milling machine to produce shallow concave depressions in the HMA shoulder surface.



The milled surface is then sealed with asphalt emulsion to prevent intrusion of water into the HMA shoulder.

Standard Road Plan RH-64 (or PV-12, if specified) illustrates configurations and details for shoulder rumble strips on Interstates, Expressways, and paved shoulders of two-lane roadways. The grinding pattern itself is the same for all three situations, utilizing an industry standard width, depth, and spacing. Differences lie in the distance offset from the painted edge line and the “skip” pattern specified for two-lane roadways and the outside shoulder of expressways. Grinding dimensions and alignment of the pattern should be randomly checked and adjusted, if necessary. Rumble strips are typically placed on mainline HMA shoulders only, with the pattern omitted at specified locations near intersections and ramps & loops.

Milling equipment variations can result in differences in the rumble strip construction operation. The cutting head must be capable of providing a smooth cut, without tearing or snagging the HMA pavement. Multiple cutting heads and electronic controls can speed the process and eliminate variability in milling depth and pattern.

All loose material resulting from the milling operation must be removed from the shoulder on a daily basis. Some milling machines are equipped with a vacuum system to assist in this effort. Millings may be used as fillet material adjacent to the paved shoulder, or may become property of the contractor and properly disposed of off the project. Specific plans may require the millings to be taken to a designated location.



Bituminous Fog Seal is used to coat the rumble strips and thereby reduce premature deterioration of the milled (open) surface. Asphalt emulsion is typically placed on the milled rumble strips only, unless the contract documents call for sealing the entire shoulder.

Additional equipment, material and construction requirements are included in the Supplemental Specification entitled Milled Shoulder Rumble Strips (HMA or PCC Surface).



Granular Shoulders

(Specification 2121)

Type B granular shoulders are typically specified adjacent to most HMA pavements. For resurfacing projects, additional granular material is added to existing shoulders to bring them up to the design cross section and eliminate dropoffs at the pavement edge. In some cases, earth fill is required prior to placing granular material.

Minimal surface preparation is generally required prior to placement of granular shoulder material. Existing vegetation is removed and deposited on the foreslope. Bituminous edge rut material and existing aggregate is salvaged and placed on the outer shoulder area.

Granular shoulder material is deposited directly on the shoulder for the width designated and shall not be dumped on the pavement. Blading granular material across the pavement will potentially damage / scar the surface. The aggregate is compacted with no less than four complete coverages of the entire surface with either a pneumatic tired roller or steel tired roller. One finish pass with steel roller follows. Additional



moistening may be required if the aggregate is too dry to readily compact.

Placement of granular shoulders must be coordinated to bring up the shoulders adjacent to the paving operation before the lane may be opened to traffic. A fillet of granular material (minimum width six times the thickness of resurfacing completed) may be used to temporarily correct a drop-off created by resurfacing. Material used for the temporary fillet must be bladed across the width of the shoulder prior to placing the final layer of granular shoulder.

Winter Shutdown

(Specifications 2121.03, C, 2214.03, D, 2303.03, C, 6, 2318, & 2527.03)

Projects are sometimes required to have a winter shutdown period. This may be planned, such as with a multi-year project when all work can not be completed in one season. For other projects this may be the result of delays due to weather, availability of materials, or project timing itself. The recent increase in projects with winter shutdown has necessitated additional specification requirements to address the following issues.

Granular Shoulders

Granular shoulder material shall be brought up to the pavement edge for the full width of the shoulder, at the design cross slope, prior to winter shutdown. This serves to increase safety to the traveling public as well as assist necessary winter maintenance operations.

Scarification

When resurfacing is part of the contract, all scarified surfaces shall be covered with at least one full lift of HMA prior to winter shutdown. The HMA provides a safer

roadway surface and protects the existing pavement from damage during the winter.

Headers

Headers, when required to end paving for winter shutdown, shall be located across from each other.

Temporary Runouts

When required to end paving for winter shutdown, runouts shall be located adjacent to each other. The runout shall be 25 feet in length per 1 inch of lift thickness. The runout shall be removed before paving resumes. The additional runout length provides increased safety to drivers during the extended shutdown period versus the 10' temporary (end of day) runout.

Cold In-Place Recycling

When resurfacing is part of the contract, all cold in-place recycled surfaces shall be covered with at least one full lift of HMA prior to winter shutdown. The HMA seals and protects the recycled surface from damage and deterioration during winter.

Pavement Markings

The specifications require that pavement markings be completed before the roadway is open to traffic (or within a limited number of working days after the roadway opening, depending on the marking type). This requirement also applies to placement of edge lines and symbols prior to winter shutdown. The contractor is typically paid the unit bid price for the additional pavement marking quantities required. This increases safety by providing necessary guidance to the traveling public during a winter suspension period.

Tickets, Quantities, and Yield

(Specification 2001.07)

Tickets

Tickets must accompany every load of HMA to be used as documentation. The ticket should show the project number, mix type, mix design number, date, and tons represented. Tickets for projects with quantities over 10,000 tons of asphaltic mixtures must be automatically printed.

Quantities

Check project plans for design quantities based on design weights, thickness, width, and lengths. Look for extra quantities for fillets, crown correction, and irregularities. Check and double check the quantities of mix used on the road and verify the totals with the plant daily. Quantities must be watched carefully for over/under-runs.

Yield

Yield is a measure of the area of pavement, of known thickness, that will be produced by a quantity of hot mix asphalt. If mat width is known, yield determines the distance a known quantity of hot mix will pave. This information tells the inspector many things, including how far each truckload of hot mix will pave and, more importantly, alerts the inspector that the average design thickness is being exceeded which may result in a quantity overrun.

The term “yield” is often used when referring to the comparison of the actual quantity of hot mix asphalt incorporated into the project versus the design quantity shown on the plans for a given portion of the work. In this case, yield is usually expressed as a percentage of plan quantity.

It is recommended that the yield be checked every 2 hours. Calculate the tons required

per station for various widths of pavement that will be laid prior to the start of paving. All calculations should be based on the design weight (145 lbs. per cu. ft. or as shown otherwise in the plans). Keep daily yields as well as cumulative (to date) yields. To avoid surprises at the end of the project, it is advisable to occasionally project the final yield by totaling the quantity used to date with the calculated remaining quantity to be placed and comparing this total to the project (plan) quantity.



Contractor Sampling

(Specification 2303.03, D, 3;

Materials IM's 204, 301, 322, 323)

Uncompacted hot mix asphalt (hot box) samples are taken behind the paver and ahead of the rollers. For a typical project, the contractor is responsible for field sampling. The project inspector or monitor must direct and witness sampling to ensure that samples are timely and taken properly, by appropriately certified personnel.



The first production sample each day shall be obtained within the first 500 tons of mix produced. Subsequent daily samples will be obtained from the remaining daily production by dividing the anticipated production beyond the first 500 tons into three sublots and randomly selecting a sampling point within each sublot. When less than 2000 tons of mix is anticipated to be produced in a day, samples shall be obtained at a minimum rate of one per 750 tons, after the first 500 tons is sampled.

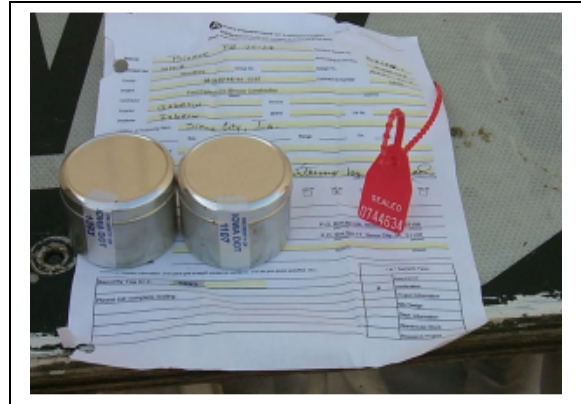
Contractors may, at their discretion, obtain and analyze additional samples of plant produced mixture. This practice is encouraged and will allow better product quality control because of the additional



information provided. However, only the information obtained from samples selected at random and designated as "production samples" will be used for specification compliance and included in the moving averages.

The inspector or monitor is typically required to direct and witness contractor sampling of other materials, such as aggregates and asphalt binder. The methods and procedures for sampling are given in applicable Materials IM's and are also taught in required Iowa DOT certification courses. Minimum sampling frequencies are as stated in IM 204. All sampling done for project acceptance purposes must be directed and witnessed by the inspector or monitor. Whenever possible, the inspector or monitor should accommodate contractor requests for additional sample witnessing beyond minimum requirements.

The inspector must properly identify samples (using Form 193) and use tamper-proof security measures if custody of the samples is not maintained by the contracting authority. This situation commonly occurs when the contractor or other courier service transports the samples to the lab for testing.



Coring

(Specification 2303.03, D, 5;
Materials IM's 204, 320, 321;
Construction Manual section 8.13)

The contractor cuts samples from any HMA course or finished HMA pavement for tests to determine density, thickness, and/or composition (when appropriate). The inspector identifies the limits of each section (sublot) and marks the random location of each core.



Chapter 8

Computer programs and spreadsheets are available to assist inspectors in determining random core locations.

Unless specified otherwise, the sampling frequency shall comply with Materials IM 204. The specifications require seven samples to be cut from each lot of construction (eight samples are taken for test strips). For surface courses designed 1-inch or less in thickness, each one-half day's construction is designated as a lot. Each full day's production may be separated into two lots for determination of quality index for density. However, this must be agreed to at the preconstruction conference.

The inspector directs and witnesses core drilling and, when applicable, determines and records core lengths. The core sample should then be inspected (for defects and appropriate length) to determine if it is a representative and valid for testing. If not, the original core should be discarded and a replacement sample taken.

Transportation of cores to the lab for testing should be coordinated with the plant monitor, such that custody of the samples by the contracting authority is maintained. If transported by others, the samples must be properly identified and secured.

Unless the contract documents indicate otherwise, core density testing is performed by the inspector or plant monitor. The testing is typically done in the project field lab, using the contractor's test equipment. Contractor personnel assist in preparing (sawing, etc.) the core sample for testing. Testing personnel must be properly trained and certified for the testing duties required. Density testing requirements are given in Materials IM 321.

The specifications also describe a statistical procedure for field density evaluation,

[illegible]

together with a formula for payment adjustments when noncompliance occurs. The project inspector should become familiar with the specification requirements, as well as the inspection procedures for compacted HMA samples outlined in Construction Manual Section 8.13.

Smoothness Testing

(Specifications 2316 & 2317; Materials IM 341; Construction Manual section 8.14)

The requirements for pavement smoothness are outlined in Specification Sections 2316 and 2317. Pavement smoothness is evaluated for all primary and interstate mainline pavement surfaces, except when specifically excluded by the contract documents. Smoothness is measured with a 25-foot California type profilograph, which produces a profilogram (profile trace) of the surface tested.



The method of testing using the profilograph (and interpretation of the profile trace) is outlined in Materials IM 341.

The results of smoothness testing are used as a basis for incentive payments to the contractor or price reductions, as appropriate. The results are also used to determine whether corrective actions, such as grinding bumps or replacing pavement, are required.

Contractors are encouraged to use a profilograph to check for bumps whenever possible. Areas of pavement that are not tested with a profilograph are to be checked with a rolling surface checker / straightedge by the Contracting Authority. Inspectors should become familiar with proper use of this equipment.

